Statement of Basis

Construction Permit

Ring-Neck Energy & Feed, LLC

Onida, South Dakota

South Dakota Department of Environment and Natural Resources

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1.0 Background

On September 30, 2015, the South Dakota Department of Environment and Natural Resources (DENR) received a construction permit application for an ethanol plant, Ring-Neck Energy and Feed, LLC (Ring-Neck Energy). The proposed ethanol production facility will be located near Onida, South Dakota.

1.1 Proposed Facility

Table 1-1 summarizes Ring-Neck Energy's proposed equipment for the ethanol production facility.

Table 1-1 Description of Proposed Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device
#1	Grain receiving, grain transfer, and storage bin loading. The grain is received in 2 truck receiving pits and 1 rail receiving pit and is transferred to grain storage.	20,000 bushels of grain per hour per conveyor and elevator	Baghouse
	Grain cleaning. Elevator legs transport the grain from the storage bins to a grain scalper and transport the cleaned grain to a surge bin.	20,000 bushels of grain hour	
#2	Grain milling. An elevator leg transports the grain from the surge bin to one of four hammer mills.	1,500 bushels of grain per hour per hammer mill	Baghouse
#3	Fermentation process. This process includes six fermenters and a beer well.	Each Fermenter is 1,050,000 gallons and the beer well is 1,370,000 gallons	Wet Scrubber
#4	Distillation process. This process includes a slurry tank, two liquefaction tanks, flash tank, cook tank, yeast tank, beer stripper, side stripper, rectifier column, molecular sieve, evaporator, and condenser.	100 million gallons of denatured ethanol per year	Regenerative Thermal Oxidizer
	Whole stillage and centrate stillage tank, four centrifuges, and syrup tank.	Each centrifuge can process 185 gallons per minute	
	Two distillers grain and solubles dryers. The dryers are fired with natural gas or propane.	45 Million British thermal units per hour for each dryer	
#4b	Regenerative Thermal Oxidizer. The system is fired with natural	18 Million British thermal units per hour	

Unit	Description	Maximum Operating Rate	Control Device
	gas.		
#5	A submerged truck and two rail loading racks.	600 gallons per minute for truck loading and 1,000 gallons per minute for railcar loading.	Flare
#5b	Flare. The flare is fired with natural gas.	12.4 million British thermal units per hour	
#6	Boiler. The boiler is fired with natural gas or propane.	210 Million British thermal units per hour	Not Applicable
#7	Dried distillers grain and soulubles storage, elevator and load out spout.	318 tons per hour	Baghouse
#9	Cooling Tower.	38,900 gallons per minute	Not Applicable
#10	Cooling Cyclone.	36.7 tons per hour	Baghouse
#11	Emergency Fire Pump.	300 horsepower	Not Applicable
#12	Storage Tank T61 equipped with an internal floating roof. This tank is used to store denatured ethanol.	1,500,000 gallons of denatured ethanol	Not Applicable
#13	Storage Tank T62 equipped with an internal floating roof. This tank is used to store denatured ethanol.	1,500,000 gallons of denatured ethanol	Not Applicable
#14	Storage Tank T63 equipped with an internal floating roof. This tank is used to store Denaturant.	200,000 gallons of denaturant	Not Applicable
#15	Storage Tank T64 equipped with an internal floating roof. This tank is used to store 200- proof ethanol.	200,000 gallons of 200 proof ethanol	Not Applicable
#16	Storage Tank T65 equipped with an internal floating roof. This tank is used to store 200- proof ethanol.	200,000 gallons of 200 proof ethanol	Not Applicable

2.0 New Source Performance Standards

DENR reviewed the New Source Performance Standards listed in 40 CFR Part 60 to determine if any of the federal New Source Performance Standards are applicable to the proposed facility. The following may be applicable.

2.1 Standards for Boilers

There are three New Source Performance Standards for fossil fuel-fired steam generators. The three standards are applicable to the following steam generators:

1. 40 CFR Part 60, Subpart D: applicable to a steam generator with a maximum operating rate of 250 million British thermal units per hour or more and commenced construction after August 17, 1971;
2. 40 CFR Part 60, Subpart Db: applicable to a steam generator with a maximum operating rate of 100 million British thermal units per hour or more and commenced construction after June 19, 1984; and
3. 40 CFR Part 60, Subpart Dc: applicable to a steam generator with a minimum design heat input capacity equal to or greater than 10 million Btus per hour but less than or equal to 100 million British thermal units per hour and commenced construction after June 9, 1989.

The proposed boiler at Ring-Neck Energy will have a maximum heating capacity of 210 million British thermal units per hour. The boiler is not subject to subject to Subpart D as the maximum heating capacity is less than 250 million British thermal units per hour. Additionally, Subpart Dc is not applicable because the heating input is more than 100 million British thermal units per hour.

Ring-Neck Energy's proposed boiler is rated at greater than 100 million British thermal units per hour and will commence construction after June 19, 1984. Therefore, the proposed boiler will be subject to Subpart Db. Ring-Neck Energy will be required to meet the requirements under the subpart for the natural gas fired boiler. It should be noted for the purposes of this subpart, propane is considered to be natural gas.

2.2 Standards for Storage Tanks

There are three New Source Performance Standards for storage vessels. The three standards are applicable to the following storage vessels:

1. 40 CFR Part 60, Subpart K: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after June 11, 1973 but prior to May 19, 1978;
2. 40 CFR Part 60, Subpart Ka: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after May 18, 1978 but prior to July 23, 1984; and
3. 40 CFR Part 60, Subpart Kb: applicable to storage vessels for volatile organic liquids capable of storing 75 cubic meters (approximately 19,813 gallons) or greater and commenced construction after July 23, 1984.

All of Ring-Neck Energy's proposed tanks will commence construction after July 23, 1984. Therefore, Subpart K and Ka are not applicable. Some of the proposed tanks will be greater than 75 cubic meters (19812.9 gallons) and are possibly applicable to Subpart Kb.

Subpart Kb applies to tanks greater than 151 cubic meters (39,890 gallons) storing liquids with a maximum true vapor pressure greater than 3.5 kilopascals (0.51 pounds per square inch) and to tanks with a storage capacity between 75 cubic meters to 151 cubic meters storing liquids with a maximum true vapor pressure greater than 15 kilopascals (2.18 pounds per square inch). Table

2.1 lists the proposed tanks, tank size, the maximum true vapor pressure of the liquids being stored in the tanks, and the applicability of Subpart Kb.

Table 2-1: Tank and Volatile Organic Liquid Specifications

Unit	Description	Capacity		Max True Vapor Pressure	Subpart Kb Applicable
		Gallons	Cubic Meters	(kilopascal)	
#12	Storage Tank T61	1,500,000	5,678.1	11.03	Yes
#13	Storage Tank T62	1,500,000	5,678.1	41.78	Yes
#14	Storage Tank T63	200,000	757.1	41.85	Yes
#15	Storage Tank T64	200,000	757.1	6.62	Yes
#16	Storage Tank T65	200,000	757.1	6.62	Yes

All five proposed tanks will be subject to Subpart Kb.

2.3 Standards for Grain Elevators

The provisions under 40 CFR Part 60, Subpart DD is applicable to the following grain elevators:

1. The provisions of this subpart are applicable to any grain terminal elevator, which has a permanent grain storage capacity of 2,500,000 bushels. A grain terminal storage elevator means any grain elevator except those located at animal food manufacturers, pet food manufactures, cereal manufacturers, breweries, and livestock feedlots; or
2. The provisions of this subpart are applicable to any grain storage elevator, which has a permanent grain storage capacity of 1,000,000 bushels. A grain storage elevator means any grain elevator located at any wheat flour mill, wet corn mill, dry corn mill (human consumption), rice mill, or soybean oil extraction plant; and
3. Commences construction, modification, or reconstruction after August 3, 1978.

Ethanol plants are considered a grain terminal elevator. To be applicable to this subpart, Ring Neck Energy's permanent grain storage capacity has to be greater than or equal to 2,500,000 bushels. The permanent grain storage at Ring-Neck Energy's proposed facility is 2,261,000 bushels. Therefore, the proposed facility is not applicable to this subpart.

2.4 Standards for Synthetic Organic Chemical Manufacturing

There are two New Source Performance Standards for synthetic organic chemical manufacturing industries. The two standards are applicable to the following:

1. 40 CFR Part 60, Subpart VV is applicable to affected facilities in the synthetic organic chemical manufacturing industry, of which ethanol is included; and commence construction, reconstruction or modification after January 5, 1981, but before November 8, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol; and
2. 40 CFR Part 60, Subpart VVa is applicable to affected facilities in the synthetic organic chemical manufacturing industry that commence construction, reconstruction, or

modification after November 7, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol.

Ring-Neck Energy's proposed facility will produce ethanol, which is considered a synthetic organic chemical under both Subparts. The facility will be constructed after November 7, 2006. Therefore, the provisions of Subpart VVa are applicable to their proposed operations.

2.5 Standards for Stationary Compression Ignition Engines

The provisions under 40 CFR Part 60, Subpart IIII were promulgated July 11, 2006, and applicable to owners or operators of stationary compression ignition internal combustion engine that commenced construction after July 11, 2005 and the generator was manufactured after April 1, 2006.

Ring-Neck Energy's proposed facility will include a fire pump meeting the above conditions. Therefore, the provisions of Subpart III are applicable to the proposed fire pump.

2.6 Other Applicable New Source Performance Standards

DENR reviewed the other New Source Performance Standards and determined there are no other standards applicable to Ring-Neck Energy.

3.0 New Source Review

In accordance with ARSD 74:36:10:01, the new source review regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. This facility is located near Onida, South Dakota, which is in attainment or unclassifiable for all the criteria air pollutants regulated under the Clean Air Act. Therefore, Ring-Neck Energy is not subject to a new source review.

4.0 Prevention of Significant Deterioration

Any stationary source which emits or has the potential to emit 250 tons per year or more of any air pollutant is considered a major source and is subject to prevention of significant deterioration (PSD) requirements (ARSD 74:36:09 – 40 CFR. Part 52.21(b)(1)). Any stationary source which emits or has the potential to emit 100 tons per year or more of any air pollutant and is one of the 28 named PSD source categories is subject to PSD requirements (ARSD 74:36:09 – 40 CFR. Part 52.21(b)(1)). The following is a list of regulated pollutants under the PSD program:

1. Total suspended particulate (PM);
2. Particulate matter with a diameter less than or equal to 10 microns (PM_{10});
3. Particulate matter with a diameter less than or equal to 2.5 microns ($PM_{2.5}$);
4. Sulfur dioxide (SO_2);
5. Nitrogen oxides (NO_x);

6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOC);
8. Lead;
9. Greenhouse gases (carbon dioxide, nitrous oxide, methane, etc.)
10. Fluorides;
11. Sulfuric acid mist;
12. Hydrogen sulfide;
13. Reduced sulfur compounds; and
14. Total reduced sulfur.

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the Federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases.

The Environmental Protection Agency (EPA) promulgated a final rule that states ethanol plants are not considered a chemical manufacturing plant. Therefore, Ring-Neck Energy is not classified as one of the 28 listed source categories for PSD regulations and the major source threshold is 250 tons per year, except for greenhouse gases.

On June 23, 2014, the Supreme Court of the United States issued a ruling that the EPA could not require facilities to obtain a PSD permit based solely on greenhouse gas emissions. The Supreme Court of the United States stated a facility must trigger one of the major source thresholds for another regulated pollutant before a greenhouse gas emission can be considered under the PSD permitting program.

4.1 Potential Emissions

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

ARSD 74:36:01:12 defines potential to emit as the maximum rated capacity of a source to emit a pollutant under its physical or operational design. Any physical or operational limitation on the capacity of a source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted stored or processed, shall be treated as part of its design if the limitation is federally enforceable.

To make a limitation federally enforceable, the limitation must be in a state or federal regulation, a state or federal permit, etc. To determine if additional limitation on the use of control systems or operational limits is necessary to allow Ring Neck Energy to forgo a PSD review, DENR reviewed Ring-Neck Energy's potential emissions prior to any additional limitations beyond the required federal standards in Chapter 2.0.

4.1.1 Uncontrolled Potential to Emit

For the purposes of this review DENR will examine the fermentation unit. In previous reviews, DENR has established that the uncontrolled emission rate for volatile organic compounds from a fermentation system is very high. Additionally, DENR evaluates emissions on an every hour of every day (8,760 hours per year) basis for potential emissions. Table 4-1 includes the uncontrolled emission rate found in similar plant to that proposed by Ring-Neck Energy. The listed ethanol production rate for the existing ethanol plant will used to scale up to the proposed size of Ring-Neck Energy.

Table 4-1: Fermenter Uncontrolled Emissions

Facility	Undenatured Ethanol Production (Million gallons per year)	Uncontrolled Emissions (Pounds per hour)	Uncontrolled Emissions (Tons per year)
Exiting Facility[1]	60	565.3	2,476
Ring-Neck Energy	98.51	928.1	4,065

[1] – January 23, 2006, Statement of Basis Permit #28.0503-57

Based on uncontrolled potential emissions from just the fermentation system, Ring-Neck Energy would have emissions in excess of the major source threshold for volatile organic compounds. Ring Neck Energy has proposed the operation of control systems on the ethanol plant. Therefore, Ring Neck Energy may not be subject to major source requirements under the Prevention of Significant program if the operations of the control systems are made enforceable. To allow Ring-Neck Energy to forgo a Prevention of Significant review, DENR will establish short term emissions limits for the applicable criteria pollutants.

4.1.2 Proposed Short Term Limits for Controlled Systems

Equation 4-1 will be used to calculate potential emissions from units with applicable or proposed short term limits.

Equation 4-1 Potential Emissions

$$Potential\ Emissions\left(\frac{Tons}{Year}\right) = \frac{ShortTermLimit\left(\frac{Pounds}{Hour}\right) \times 8{,}760\left(\frac{hours}{Year}\right)}{2{,}000\left(\frac{Pounds}{Ton}\right)}$$

Table 4-2 contains the proposed short term limits for Ring-Neck Energy. See Table 4-9 for the results of inputting the short term limits into Equation 4-1.

Table 4-2: Short Term Limits (pounds per hour)

Unit	Description	TSP	PM_{10}	$PM_{2.5}$	NO_x	VOC	CO
#1	Grain Receiving	2.1	2.1	2.1			
#2	Grain Milling	1.2	1.2	1.2			
#3	Fermentation					13.0	
#4	Distillation/Dryers/RTO	6.0	6.0	6.0	15.4	12.2	8.7
#6	Boiler	1.7	1.7	1.7	21.0[1]	2.3	17.3

#7	DDGS Loadout	0.2	0.2	0.2			
#10	Cooling Cyclone	0.2	0.2	0.2		3.3	

[1] – This unit is subject to a nitrogen oxide emissions limit in 40 CFR Subpart Db. The listed short term limit is the maximum emission rate under that subpart.

4.1.3 Potential Fire Pump Emissions

Ring-Neck Energy's proposed fire pump will emit criteria pollutants. The fire pump has been designated as emergency use. Emission Factors for reciprocating internal engines can be found in the EPA's AP-42 document. Table 4-3 contains the applicable emission factors.

Table 4-3: Emission Factors (pounds per horsepower-hour)

Reference	**TSP**[2]	**PM_{10}**	**$PM_{2.5}$**	**NOx**	**SO_2**	**VOC**	**CO**
AP-42 Table 3.3-1 (10/1996)	0.0022	0.0022	0.0022	0.031	0.0021	0.0025[1]	0.0067

[1]- Includes exhaust and crankcase emissions.

DENR estimates potential emissions for emergency use reciprocating internal combustion engines using a 500 hour per year basis. This is due to limitations set forth in federal standard (New Source Performance Standards Subpart IIII and Maximum Achievable Control Technology Subpart ZZZZ). Equation 4-2 will be used to calculate potential emissions. Potential emissions are shown in Table 4-9.

Equation 4-2 Fire Pump Potential Emissions

$$PotentialEmissions\left(\frac{Tons}{Year}\right) = \frac{EmissionFactor\left(\frac{Pounds}{Horsepower - Hour}\right) \times 300(Horsepower) \times 500\left(\frac{hours}{Year}\right)}{2{,}000\left(\frac{Pounds}{Ton}\right)}$$

4.1.4 Potential Cooling Tower Emissions

Ring-Neck Energy provided calculations for particulate emissions from the cooling tower. They cite 2.06 pounds per hour emission rate citing a manufacturer specification. DENR agrees with this calculation. Equation 4-1 will be used to calculate potential emissions from the cooling tower.

4.1.5 Potential Tank Emissions

Ring-Neck Energy has proposed construction of five large storage tanks. These tanks will have VOC emissions from their storage contents. DENR uses the Tanks 4.0.9d program to estimate potential emissions from tanks. The facility has requested 100 million gallons of denatured ethanol throughput and the regulation outside the air program allow for a denaturant rate up to 2.5 percent in the application. Emissions from tanks are much higher from gasoline storage tanks; therefore, the worst case of a 2.5 percent denaturant rate will be used. In the application, a gasoline with a Reid vapor pressure of 10 was listed as the denaturant; therefore, that type of gasoline is used in the calculations. Additionally, the tank dimensions used in the tanks program were taken from the application and Huron, South Dakota was designated as the closest major city. Table 4-4 contains the potential emissions of Units #12-#16 from conducting a Tanks

analysis.

Table 4-4: Tank Emissions

Unit	Description	Capacity (gallons)	Contents	Throughput (gallons per year)	VOC emissions (tons per year)
#12	Storage Tank T61	1,500,000	Denatured Ethanol	50,000,000	0.28
#13	Storage Tank T62	1,500,000	Denatured Ethanol	50,000,000	0.28
#14	Storage Tank T63	200,000	Denaturant	2,500,000	1.54
#15	Storage Tank T64	200,000	200 Proof Ethanol	47,500,000	0.26
#16	Storage Tank T65	200,000,	200 Proof Ethanol	47,500,000	0.26

4.1.6 Potential Loading Rack Emission

Ring-Neck Energy has potential emissions from the load out dentatured ethanol to trucks and railcars. These emissions are estimated using two separate scenarios. Those two scenarios are loading out all of the denatured ethanol by railcar without a control device and loading out all of the denatured ethanol by truck with the use of a flare as a control device. Emissions from the loadout of the ethanol can be calculated using AP-42 Chapter 5 Section 2. Equation 4-3 will be used to calculate emissions from the load out operations.

Equation 4-3 Load Loss Equation

$$Loadingloss\left(\frac{pounds}{1000\ gallons}\right) = \frac{S \times P \times M}{T}\left(1 - \frac{eff}{100}\right)$$

Where:

- S=Saturation Factor (AP-42 Table 5.2-1)
- P=Maximum True Vapor Pressure, psia, (DENR Tanks Calculation)
- M=Molecular Weight of Vapors, pound per pound-mole. (DENR Tanks Calculation)
- T=Temperature of liquid loaded, Degrees Rankine (Degrees Fahrenheit + 459.67), (DENR Tanks Calculation)
- Eff=Destruction efficiency of flare, %

Table 4-5 contains the variables above as well as the result of applying Equation 4-3.

Table 4-5: Loading Loss

Loadout Operation	Saturation Factor	Max Vapor Pressure (psia)	Molecular Weight (lbs/lbs-mole)	Temperature (°R)	Efficiency	Loading Loss (Pounds per 1000 gallons)
Truck	1.0	0.7351	48.8	504.9	98	0.0014
Rail	0.6	0.7351	48.8	504.9	0	0.0436

Due to the installation of the flare, the loading loss rate from railcar loading will be the worst case scenario for potential volatile organic compound emissions. Therefore, all 100 million gallons of potential through put will be assumed to be loaded out by rail for the purposes of this

review. This equates to 2.18 tons of volatile organic compound emissions per year.

Even though railcar loading is the worst case scenario for volatile organic compounds, the use of the flare would generate other criteria air pollutant emissions. These emissions should also be considered.

AP-42 provides a document on industrial flares. Although, emissions are based on a propylene fired flare. DENR does not agree the emissions would be equivalent to a natural gas fired flare. Therefore, emissions from the flare will be considered similar to burning natural gas from an external combustion source (Uncontrolled Boiler <100 million British Thermal units per hour). Table 4-6 contains the emissions factors.

Table 4-6: AP-42 Emission Factors (pounds per million British thermal units)

Reference	TSP	PM_{10}	$PM_{2.5}$	NOx	SO_2	VOC	CO
AP-42 Table 1.4-1 – 1.4-2 (10/1996)	0.007	0.007	0.007	0.098	0.0006	0.005	0.082

Equation 4-4 will be used to calculate potential emissions and results are shown in Table 4-9.

4.1.7 Other Potential Sulfur Dioxide Emission

Sulfur dioxide is not a product of ethanol production. The proposed ethanol plant will burn fuel to operate equipment, including the boiler, dryer, and regenerative thermal oxidizer that have the potential to emit sulfur dioxide. DENR will use EPA's AP-42 to estimate emissions from these units. Ring-Neck Energy has proposed using both propane and natural gas in some units; therefore, emissions factors for both fuels will be included.

The boiler, regenerative thermal oxidizer, and dryer are considered external combustion sources therefore AP-42 Chapter 1 will be used to estimate emissions. Table 4-4 contains the emission factors. The sulfur dioxide emissions for propane are dependent on sulfur content of the propane. DENR assumes sulfur content of propane is similar to natural gas. AP-42 lists the sulfur content for natural gas of 0.2 grains per 100 cubic feet. Therefore, sulfur dioxide for propane emissions will be estimated with this value. Table 4-7 contains the emission factors.

Table 4-7 AP-42 Sulfur Dioxide Emission Factors (pounds per Million Btu)

Fuel Type	Reference	SO_2
Propane	AP-42 Table 1.5-1 (07/2008)	0.0002
Natural Gas	AP-42 Table 1.4-2 (07/1998)	0.0006

Equation 4-4 will be used to calculate potential emissions. The results of applying the equation can be found in Table 4-9.

Equation 4-4 Potential Sulfur Dioxide Emissions

$$PotentialEmissions\left(\frac{Tons}{Year}\right) = \frac{EmissionFactor\left(\frac{Pounds}{Million\ Btu}\right) \times HeatInput\left(\frac{MillionBtus}{Hour}\right) \times 8{,}760\left(\frac{hours}{Year}\right)}{2{,}000\left(\frac{Pounds}{Ton}\right)}$$

4.1.8 Potential Fugitive Emission

As noted in 40 CFR Part 52 § 52.21(b)(1)(iii), fugitive emissions are not included in the potential to emit unless the facility is one of the 28 named sources or if the facility is one of the source categories was regulated as of August 7, 1980, under Section 111 (New Source Performance Standard – Chapter 2.0) and/or 112 (New Source Performance Standards for Hazardous Air Pollutants – Chapter 6.0). As noted above, Ring Neck Energy is not one of the 28 names sources. In addition, the only federal standards covering a source category that may have been regulated prior to August 7, 1980, that may be applicable to Ring Neck Energy are the New Source Performance Standards for Tanks (Subpart K and Ka) and Grain Elevators (Subpart DD). DENR has considered the regulated emissions (tanks, grain receiving, grain handling, etc.) from these Subparts in its calculations. Therefore, no additional fugitive emission calculations are necessary.

4.1.9 Facility Wide Potential Emissions

Table 4-9 contains the consolidated potential emissions from the above sections.

Table 4-9: Potential Emissions

Unit	Description	TSP	PM_{10}	$PM_{2.5}$	SO_2	NO_x	VOC	CO
#1	Grain Receiving	9.2	9.2	9.2				
#2	Grain Milling	5.3	5.3	5.3				
#3	Fermentation						59.9	
#4	Distillation/Dryers/RTO	26.3	26.3	26.3	0.28	67.5	53.4	38.1
#5	Truck Loading Rack and Flare	0.4	0.4	0.4	0.03	5.3	2.5	4.5
#6	Boiler	7.4	7.4	7.4	0.55	92.0	10.1	75.8
#7	DDGS Loadout	0.9	0.9	0.9				
#9	Cooling Tower	10.7	10.7	10.7				
#10	Cooling Cyclone	0.9	0.9	0.9			14.5	
#11	Fire Pump	0.17	0.17	0.17	0.16	2.33	0.19	0.50
#12	Denatured Ethanol Tank #1						0.28	
#13	Denatured Ethanol Tank #2						0.28	
#14	Denaturant Tanks						1.54	
#15	200 Proof Tank #1						0.26	
#16	200 Proof Tank #2						0.26	
	Total	**61**	**61**	**61**	**1**	**167**	**143**	**119**

The major source Prevention of Significant Detonation threshold is 250 tons per pollutant. Therefore, based on potential emissions Ring-Neck Energy will be considered a minor source and not subject to a Prevention of Significant Deterioration review. Due to short term limits being used to maintain minor source status, long term limits will be required to be placed in the permit to ensure continued minor source status for total suspended particulate, particulate matter with a diameter less than or equal to 10 microns, particulate matter with a diameter less than or equal to 2.5 microns, nitrogen oxides, volatile organic compounds and carbon monoxide. DENR limits facilities requesting these limits to 238 tons per year per pollutant. Sulfur dioxide has potential emissions less than 250 tons and is not subject to short term limits; therefore, no long term limit is required.

4.2 PSD Summary

Ring-Neck Energy's potential criteria pollutant emissions are less than 250 tons per year. Based on the US Supreme Court's decision and because Ring-Neck Energy is not applicable to the PSD program, a review for greenhouse gas emissions is not warranted or required.

5.0 National Emission Standards for Hazardous Air Pollutants (HAPs)

DENR reviewed 40 CFR Part 61 to determine the applicability to this facility to any of the subparts and determined none of the Subparts would be applicable.

6.0 Maximum Achievable Control Technology Standards

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

6.1 Potential Hazardous Air Pollutant Emission

There are three types of hazardous air pollutants, organic hazardous air pollutants, metal hazardous and non-organic hazardous air pollutants. Organic hazardous air pollutants are also accounted for in the volatile organic compound potential emissions. Ethanol plants are not sources of the other types except from fuel burning sources which may emit small amounts of metal hazardous air pollutants.

Ring-Neck Energy has requested limits to allow the facility to be considered an area source for hazardous air pollutants.

6.1.1 Potential Emissions from Units with Short Term Limits.

Ring-Neck Energy has accepted volatile organic compound limits on Units #3, #4, #6 and #10. These units may also have potential emissions of hazardous air pollutants.

Units #3, #4 and #10 are involved directly with ethanol or dried distillers grain production. The hazardous air pollutant emissions from these units are not readily available. These units are common at all ethanol plants and emissions can be estimated based on performance tests

conducted at similar facilities in the State of South Dakota. Table 6-1 contains emissions data for individual hazardous air pollutants at similar facility to those proposed by Ring-Neck Energy. It should be noted the representative facility is smaller than the proposed facility. Therefore, the emissions rates will be scaled up accordingly. The 98.51 million gallon undenatured ethanol production rate in the application will be used to scale up the controlled hazardous air pollutant emission rates.

Table 6-1: Emissions Data

Unit Type	Pollutant	Emission Rate (pounds per hour)	Permitted Production Rate	Proposed Production Rate	Adjusted Emission Rate (pounds per hour)
Wet Scrubber1 (Unit #3)	Acetaldehyde	0.72	60 Million gallons of undenatured ethanol	98.51 Million gallons of undenatured ethanol	1.18
	Acrolein	0.09			0.15
	Formaldehyde	0.03			0.05
	Methonol	0.02			0.03
Regenerative Thermal Oxidizer[2] (Unit #4)	Acetaldehyde	0.02	Not Applicable[3]		0.02
	Acrolein	0.02			0.02
	Formaldehyde	0.02			0.02
	Methonol	0.19			0.19
Cooling Cyclone[4] (Unit #10)	Acetaldehyde	0.04	Not Applicable[3]		0.04
	Acrolein	0.03			0.03
	Formaldehyde	0.01			0.01
	Methonol	0.02			0.02

[1] – Test conducted December 8, 2011, Title V operating permit #28.0503-57, testing without water additive used as it is the worst case for hazardous air pollutants;
[2] - Test conducted December 8, 2011, Title V operating permit #28.0503-57;
[3] – The back half of the Ring Neck Energy's system (the drying unit and cooling cyclone) is designed to process approximately 50% of the ethanol production's distillers grain. Therefore, Ring Neck Energy's proposed equipment is similar in size to those tested at the other ethanol plant and no adjustment is required; and
[4] - Test conducted January 17, 2008, Title V operating permit #28.0503-57

Unit #6 will have potential hazardous air pollutant emissions from burning fuel. AP-42 provided emission factors for these pollutants. The amount of emissions from individual hazardous air pollutants from burning fuel is relatively small and does not typically include acetaldehyde, acrolein, or methanol. Formaldehyde may be emitted but in extremely small quantities. Therefore, potential emissions will be examined from a total hazardous air pollutant stand point. Table 6-2 contains the emission factors from both fuel options AP-42.

Table 6-2: AP-42 Emission Factors

Fuel Type	Citation	Emission Factor (Pounds per MMBtu)
Natural Gas	AP-42 Table 1.4-3	0.0019
Propane	No Data	Not Applicable

There is no hazardous air pollutant emission rate for propane listed in AP-42; therefore, the emission rate for natural gas will be used for propane. Equation 4-1 and Equation 4-4 will be used to calculate emissions. The results will be summarized in Table 6-6.

6.1.2 Potential Emissions from Tanks and Denatured Ethanol Loadout

Potential emission of hazardous air pollutant emissions from tanks and loadout operations may come from the gasoline in the products. Ring-Neck Energy provided DENR with a Material Safety Data Sheet for natural gasoline. Table 6-3 provides a breakdown of the hazardous air pollutants contained within the natural gasoline used as denaturant.

Table 6-3: Hazardous Air Pollutant Content

Pollutant	% by Weight[1]
Benzene	5
Toluene	5
Ethylbenzne	5
O,M, and P Xylene	5
Hexanes	45
Total	**65**

[1]- Maximum possible.

The ethanol tanks containing only 200-proof ethanol do not have potential emissions of hazardous air pollutants. Units storing or loading out denaturant or denatured ethanol do have potential hazardous air pollutant emissions. DENR will estimate hazardous air pollutant potential emissions based on total volatile organic compound emission, denaturant content of fluid handled, and the hazardous air pollutant content of the denaturant. It should be noted that this calculation is very conservative as it assuming all hazardous air pollutants will volatilize in their maximum concentrations. Equation 6-1 will be used to calculate emissions and potential emissions are summarized in Table 6-4.

Equation 6-1 Hazardous Air Pollutant Potential Emissions from Tanks and Loadout

$$PotentialEmissions\left(\frac{tons}{Year}\right) = VOC\ Emissions\left(\frac{tons}{Year}\right) \times Denaturant\ (\%) \times HAP(\%)$$

Table 6-4: Hazardous Air Pollutant Potential Emissions from Tanks and Loadout

Unit	#5	#12	#13	#14
Description	**Loading Racks**	**Tank T61**	**Tank T62**	**Tank T63**
VOC Emission	2.18	0.28	0.28	1.54
Denaturant Content (%)	2.5	2.5	2.5	100
Benzene at 5% (tons per year)	0.002	0.0004	0.0004	0.08
Toluene at 5% (tons per year)	0.002	0.0004	0.0004	0.08
Ethylbenzene at 5% (tons per year)	0.002	0.0004	0.0004	0.08
Xylene at 5% (tons per year)	0.002	0.0004	0.0004	0.08
Hexane at 45% (tons per year)	0.025	0.003	0.003	0.69
Total Hazardous Air Pollutants (ton per year)	**0.035**	**0.005**	**0.005**	**1.001**

6.1.3 Fire Pump Hazardous Air Pollutant Emissions

The fire pump has potential hazardous air pollutant emissions from burning fuel. AP-42 provides emission factors for these emissions. Table 6-5 contains the emissions factors.

Table 6-5: Hazardous Air Pollutant Emission Factors (Pounds per Horsepower-Hour)

Unit	Citation	Emission Factor
Fire Pump	AP-42 Table 3.3-2	0.0000271

Equation 4-2 will be used to calculate potential emission of hazardous air pollutants and the results will be summarized in Table 6-6.

6.1.4 Summary of Hazardous Air Pollutant Emissions

Table 6-6 contains a summary of potential hazardous air pollutants for the facility. Acetaldehyde was included as a single hazardous air pollutant as it is the largest contributor.

Table 6-6: Summary of Hazardous Air Pollutant Emissions (tons per year)

Unit	Description	Acetaldehyde	Total HAP
#3	Fermentation	5.2	6.2
#4	Distillation/Dryers/RTO	0.1	2.0
#5	Loading Racks	0	0.0
#6	Boiler	0	1.7
#10	Cooling Cyclone	0.2	0.4
#12	Storage Tank T62	0	0.0
#13	Storage Tank T63	0	0.0
#14	Storage Tank T64	0	1.0
	Total	**6**	**11**

The major source threshold for hazardous air pollutant is 10 tons for a single pollutant and 25 tons for every pollutant. Therefore, based on the potential emission Ring-Neck Energy will be considered a minor source for hazardous air pollutants. Since uncontrolled emissions would be in excess of the hazardous air pollutant threshold for a major source, hazardous air pollutant emission limits of 9.5 tons and 23.8 tons for single and all hazardous air pollutants will be included in a permit to allow Ring Neck Energy to be considered an area source for hazardous air pollutants.

6.2 Non-Gasoline Organic Liquids Distribution

On November 10, 2003, EPA finalized Subpart EEEE under 40 CFR Part 63. This rule applies to the following chemical processing plants

1. Those facilities that produce chemicals classified using the 1987 Standard Industrial Classification Manual of a code indicated by 282, 283, 284, 285, 286, 287, 289, or 386; and
2. Are a major source of hazardous air pollutants.

Ring-Neck Energy's Standard Industrial Classification code is 2869, which falls underneath the code of 286. By including the emission limits on hazardous air pollutants of 9.5 tons and 23.8 tons for single and all hazardous air pollutants, respectively, Ring Neck Energy is considered an area source of hazardous air pollutants. Therefore, Ring Neck Energy is not applicable to this MACT standard.

6.3 Chemical Processing Plants

The maximum achievable control technology standard under 40 CFR Part 63, Subpart FFFF rule applies to the following chemical processing plants:

1. Those facilities that produce chemicals classified using the 1987 Standard Industrial Classification Manual of a code indicated by 282, 283, 284, 285, 286, 287, 289, or 386; and
2. Those facilities that are a major source of hazardous air pollutants. A major source of hazardous air pollutants has the potential to emit 10 tons of a single hazardous air pollutant and/or 25 tons of all hazardous air pollutants.

Ring-Neck Energy's Standard Industrial Classification code is 2869, which falls underneath the code of 286. By including the emission limits on hazardous air pollutants of 9.5 tons and 23.8 tons for single and all hazardous air pollutants, respectively, Ring Neck Energy is considered an area source of hazardous air pollutants. Therefore, Ring-Neck Energy is not applicable to this Subpart.

6.4 Stationary Reciprocating Internal Combustion Engines

The maximum achievable control technology under 40 CFR Part 63, Subpart ZZZZ establishes national emission and operating limitations for hazardous air pollutants emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of hazardous air pollutant emissions. Therefore, Ring-Neck Energy is applicable to this subpart. The facility will be required to comply with 40 CFR Part 60, Subpart IIII which will satisfy the requirements under this subpart.

6.5 Industrial, Commercial, and Institutional Boilers and Process Heaters

The maximum achievable control technology under 40 CFR Part 63, Subpart DDDDD establishes national emission and operating limits for hazardous air pollutants emitted from industrial, commercial, and institutional boilers and process heaters located at a major source of hazardous air pollutant emissions. By including the emission limits on hazardous air pollutants of 9.5 tons and 23.8 tons for single and all hazardous air pollutants, respectively, Ring Neck Energy is considered an area source of hazardous air pollutants. Therefore, Ring-Neck Energy is not subject to this subpart.

6.6 Industrial, Commercial, and Institutional Boilers – Area Source

The maximum achievable control technology standard under 40 CFR Part 63, Subpart JJJJJJ applies to all new or existing industrial, commercial, and institutional boilers located at an area

source of hazardous air pollutants. In accordance with 40 CFR 63.11195 (e) a gas fired boiler is exempt from this subpart. A gas-fired boiler is defined as "…any boiler that burns gaseous fuels not combined with any solid fuels, burns liquid fuel only during periods of gas curtailment, gas supply emergencies, or periodic testing on liquid fuel." Gaseous fuels include natural gas and propane under the subpart. Therefore, Ring-Neck Energy is not subject to this subpart provided natural gas and propane are the only fuel burned in the boiler.

6.7 Gasoline Distribution

The maximum achievable control technology under 40 CFR Part 63, Subparts BBBBBB and CCCCCC apply only to bulk gasoline terminal, bulk gasoline pipeline breakout station, pipeline pumping station, or a plant gasoline distribution facility. Ring-Neck Energy does not propose to transport gasoline by pipeline, receive gasoline by pipeline, ship, or barge, ship gasoline, or dispense gasoline into motor vehicles. Therefore, these subparts are not applicable to Ring-Neck Energy.

6.8 Chemical Processing Plants – Area Source

The maximum achievable control technology under 40 CFR Part 63, Subpart VVVVVV applies to chemical manufacturing process units located at an area source of hazardous air pollutants. For Ring-Neck Energy to be applicable, Ring-Neck Energy would need to have one of the hazardous air pollutants present in a process fluid greater than 1.0 percent of those compounds listed as non-carcinogens or greater than 0.1 percent of those compounds that are considered carcinogens.

DENR's understanding, based on previous ethanol plant reviews, is that ethanol plants do not meet this definition. Therefore, Ring-Neck Energy is not applicable to this subpart.

6.9 Other MACT Standards

DENR reviewed the Maximum Achievable Control Technology Standards and determined that none are applicable to the proposed construction at Ring-Neck Energy.

7.0 State Requirements

7.1 Permit Type

In accordance with ARSD 74:36:09, a Prevention of Significant Deterioration permit is required for all sources meeting the definition of a major source. Ring-Neck Energy has accepted limitations to ensure emissions do not exceed the major source threshold for the Prevention of Significant Deterioration program. Therefore, a Prevention of Significant Deterioration Pre-Construction Permit is not required.

In accordance with ARSD 74:36:20, a construction permit is required for all new sources that are likely to emit air pollutants into the ambient air that do not meet the exemptions specified in

ARSD 74:36:20:02.01. Uncontrolled emissions from all above listed units would exceed the threshold for exemption. Therefore, a construction permit will be required to construct and operate Ring-Neck Energy's proposed facility.

7.2 State Restrictions on Visible Emissions

Visible emissions are applicable to any unit that discharges to the ambient air. In accordance with ARSD 74:36:12, a facility may not discharge into the ambient air emissions at greater than or equal to 20 percent opacity for all units.

7.3 State Emission Limits

In Accordance with ARSD 74:36:06, DENR has total suspended particulate and sulfur dioxide emission limits from process and fuel burning units.

7.3.1 State Particulate Emission Limits.

In accordance with ARSD 74:36:06:01, a unit that must comply with a total suspended particulate matter emission limit under the New Source Performance Standards, Maximum Achievable Control Technology Standards, the Acid Rain Program, or the Prevention of Significant Deterioration Program is exempt from having to meet the state's total suspended particulate matter emission limits.

In accordance with ARSD 74:36:06:02(1)(b), a fuel burning unit with a heat input equal to or greater than 10 million Btus per hour heat input may not exceed the particulate emissions rate determined by Equation 7-1.

Equation 7-1 – Particulate Emissions Limit for Fuel Burning Units

$E_{TSP} = 0.811 \times H^{-0.131}$

Where:

- E_{TSP} = emission rate, in pounds per million Btu heat input, and
- H = heat input, in million Btus per hour.

Using the maximum heat input value for the unit in Equation 7-1 results in a particulate matter emission limit listed in Table 7-1.

Equation 7-2, taken from ARSD 74:36:06:03(1)(b), is used to calculate the state limit of particulate emissions for each process unit with operating rates greater than 30 tons per hour. The state particulate emission limits are summarized in Table 7-1.

Equation 7-2 – State Particulate Emission Limit for Process Units > 30 tons per hour

$E_{TSP} = (55.0 \times P^{0.11}) - 40$

Where:

- E_{TSP} = Emission limit for total suspended particulate matter, in pounds per hour; and
- P = Design process rate, in tons per hour.

Table 7-1 – State Total Suspended Particulate Matter Emission Limit Comparison

Unit	Description	Short-term Limit TSP	State Emission Limit	Short-Term more Stringent
#1	Grain Receiving	2.1 pounds per hour	70.3 pounds per hour	Yes
#2	Grain Milling	1.2 pounds per hour	43.0 pounds per hour	Yes
#4	Distillation/Dryers /RTO	6.0 pounds per hour	0.47 pounds per MMBtu (29.7 pounds per hour)	Yes
#6	Boiler	1.7 pounds per hour	0.4 pounds per MMBtu (84.5 pounds per hour)	Yes
#7	DDGS Loadout	0.2 pounds per hour	63.7 pounds per hour	Yes
#10	Cooling Cyclone	0.2 pounds per hour	41.7 pounds per hour	Yes

Unit #9 is a cooling tower and particulate emissions are based on evaporative emissions. This unit does not have a process weight as defined in ARSD 74:36:01:13 and does not burn fuel. Therefore, Unit #9 is not subject to the South Dakota's particulate matter emission limits as it does not the definitions required to establish a state limit. Ring-Neck Energy has requested enforceable limits on particulate matter emissions to allow it to forgo a Prevention of Significant Deterioration review, these particulate matter emission limits are more stringent than South Dakota's state particulate matter emission limits as shown in Table 7-1. Therefore, South Dakota's particulate matter emission limits will not be included in the permit.

7.3.2 State Sulfur Dioxide Emission Limits

In accordance with ARSD 74:36:06:02(2) and ARSD 74:36:06:03(2), the permitted units may not emit sulfur dioxide emissions to the ambient air in an amount greater than three pounds of sulfur dioxide per million Btus of heat input.

Table 7-2 contains the proposed fuel burning units that are applicable along with their compliance status with the limit based on the potential emissions calculated in Chapter 4.

Table 7-2: State Sulfur Dioxide Limit

Unit	Description	Potential Emission Rate	Emission Limit	In Compliance
#10	Dryer/RTO	0.14 Pounds per MMBtus	3.0 pounds per MMBtus	Yes
#13	Boiler	0.14 pounds per MMBtus	3.0 pounds per MMBtus	Yes
#17	Fire Pump[1]	0.25 pounds per MMBtus	3.0 pounds per MMBtus	Yes

[1]-300 horsepower (output) = 2.1 MMBtus per hour (input) using AP-42 conversion of 7000 Btu per horsepower hour

7.4 Performance Tests

In accordance with ARSD 74:36:11:02, the Secretary may require a performance test if necessary to demonstrate compliance with the emission limits.

Ring-Neck Energy has accepted limitations to avoid being a major source for both the Prevention of Significant Deterioration and Maximum Achievable Control Technology Programs. In order to establish compliance with these limits, DENR will require performance testing. Table 7-3 contains the pollutants that will be required for each unit.

Table 7-3: Required Performance Testing

Unit	Description	Required Pollutants
#1	Grain Receiving	TSP, PM10, and PM2.5
#2	Grain Milling	TSP, PM10, and PM2.5
#3	Fermentation	VOC and HAPs
#4	Distillation/Dryers/RTO	TSP, PM10, PM2.5, NOx, VOC, HAPs, and CO
#6	Boiler	TSP, PM10, PM2.5 and CO
#7	DDGS Loadout	TSP, PM10, and PM2.5
#10	Cooling Cyclone	TSP, PM10, PM2.5, VOC, and HAPs

It should be noted that under NSPS Subpart Db, Ring-Neck Energy will be required to install a nitrogen oxides continuous emissions monitoring system or a predictive emissions monitoring system. This system will be used to demonstrate compliance with the short term limit for nitrogen oxides.

The EPA approved a methodology to determine compliance with volatile organic compound and hazardous air pollutant emission limits in a consent decree with other ethanol plants in South Dakota. DENR is recommending the following permit language be included in the construction regarding stack testing requirements for volatile organic compounds:

1. Required Test Methods. Conduct all volatile organic compound mass emission performance tests in accordance with 40 C.F. R. Part 51, Appendix M; Method 207 and 40 C. F. R. Part 60, Appendix A; Method 18 or other equivalent test method approved by the Secretary.
2. Treatment of 2,3-Butanediol. Due to difficulties associated with appropriate method detection limit, 2,3-Butanediol will be sampled through the chromatography column approximately 2.5 times faster than the maximum allowable sampling rate for the other volatile organic compounds or hazardous air pollutants in the sampling program (e.g. acetaldehyde, acrolein, and ethyl acetate). This requirement applies only if the Method 207 results indicate that 2,3-Butanediol should be sampled as part of the Method 18 testing.
3. Treatment of Non-Detects. When summing analytes per Method 18, non-detect data will be included in the total volatile organic compound and hazardous air pollutant mass as one half the compound method detection limit; except that, if all three performance test

runs result in a non-detect measurement and the method detection limit is less than or equal to 1.0 part per million by volume on a dry basis, then all such non-detect data will be treated as zero mass

7.5 Standards for Flares

The operation of a flare is not conducive to conducting a performance test. Therefore, DENR recommends the flare controlling emissions from the truck load meet the requirements in 40 CFR Part 60.18(b). The provision under 40 CFR Part 60.18(b) establish standards for the operation of flares.

7.6 Submission of a Title V Operating Permit Application

In accordance with ARSD 74:36:05:08(1), Ring-Neck Energy will be required to submit a Title V air quality operating permit application within one year of beginning production of ethanol at the proposed facility.

8.0 Recommendation

Based on the above findings, Ring-Neck Energy is required to construct and operate within the requirements stipulated in the following regulations:

1. ARSD 74:36:06 - Regulated air pollutant emissions;
2. ARSD 74:36:07 - New source performance standards;
3. ARSD 74:36:08 - National emission standards for hazardous air pollutants;
4. ARSD 74:36:11 - Performance testing;
5. ARSD 74:36:12 - Control of visible emissions; and
6. ARSD 74:36:20 – Construction permit for new sources or modifications.

Based on the information submitted in the air quality permit application, DENR recommends conditional approval of a construction permit for Ring-Neck Energy construct and operate a ethanol production facility near Onida, South Dakota. Any questions pertaining to this permit recommendation should be directed to Ashley Brakke, Engineer II, Department of Environment and Natural Resources – Air Quality Program.